

REMARKS/ARGUMENTS

In response to the Office Action mailed September 1, 2005, Applicants amend their application and request reconsideration. In this Amendment claims 1 and 2 are canceled and no claims are added so that claims 3-7 remain pending.

Claims 5 and 7 were indicated to be allowable if rewritten in independent form.

As clearly described in the patent application, for example, with respect to Figures 1A and 3A from page 5, line 25 through page 6, line 14, and page 12, lines 2-14, the invention is directed to a semiconductor laser that includes opposed front and rear end faces, sometimes referred to as facets. The front and rear end faces are end surfaces of the plurality of semiconductor layers that are laminated to form the main body of the semiconductor laser. In order to achieve laser oscillation, it is essential that the light generated within the semiconductor laser resonate between the front and rear end surfaces. In order that some of the light generated can escape from the semiconductor laser for useful application, a relatively low reflectivity film is disposed on the front end face and a relatively high reflectivity film is disposed on the rear end face. This structure, as described in the patent application, is described in more detail in the claims presented here than in the claims originally presented for examination. This kind of structure is well known in the art.

The important point of the invention, as described and claimed in the present patent application, concerns the relatively high reflectivity film disposed on the rear end face of the semiconductor laser. The fact that the film that is the principal subject of the claimed invention is at the rear end face of the semiconductor laser was apparent from examined claim 1, which recited a minimum reflectivity of that film to be 40%. Of course, as understood of those of skill in the art, this reflectivity is measured at the characteristic wavelength of the light produced by the semiconductor laser. This fundamental fact is now an express part of the claimed invention.

In this Amendment, claim 3 has been rewritten in independent form, adding the description of the basic semiconductor laser structure. A similar amendment is made to claim 4. In addition, the description of the dielectric multilayer film in claim 4 has been made more general, consistent with the original disclosure. The limitation of the examined claim 2 is not copied directly into amended claim 4 because that limitation is inherent in claim 4. These amended claims make clear that that dielectric multilayer film is disposed on the rear end face of the semiconductor laser.

Dependent claims 6 and 7 have been amended, consistent with the original disclosure. The amended claims more general encompass the disclosed invention than did examined claims 6 and 7. An inadvertent error in claim 6, referring to silicon rather than silicon oxide, is corrected.

Applicants agree that dielectric multilayer films having particular reflectivity characteristics are known in the art. However, those reflectivity characteristics are an extremely sensitive function of the materials of the layers of the multilayer film, the thicknesses of the respective layers of the multilayer film, and the wavelength of the light incident on the multilayer film. Thus, the broad comments made in the rejection of the claims presented for examination are, in many instances incorrect. The extreme variability of the characteristics of such films have been brushed aside improperly in the comments of the Office Action.

Since there are now two independent claims pending, those independent claims are considered separately with regard to the respective rejections of the originally examined claims.

Claims 3, 4, and 6 were rejected as anticipated by Collins et al. (U.S. Patent 5,363,397, hereinafter Collins). This rejection is respectfully traversed both as to amended claim 3 and its dependent claim 6 and as to amended claim 4.

Amended claim 3 describes a semiconductor laser including on the rear end face a highly reflective dielectric multilayer film including an aluminum oxide film in contact with the laminated layers of the semiconductor laser and films of silicon dioxide and tantalum oxide. In citing Collins, the Examiner directed attention the passage from column 5, line 45 through column 6, line 2. Applicants agree that that passage describes semiconductor laser structures with multilayer Bragg reflectors 107 and 109 made of various dielectric insulators, including aluminum oxide, silicon oxide, and tantalum oxide. Further, according to column 5, line 56 of Collins, as well as column 8, line 65 through column 9, line 1, the Bragg reflectors include 10 to 20 films. There is no instruction as to which of the materials should be in contact with the semiconductor layers as in claim 3. Thus, there is simply insufficient disclosure in Collins to meet the terms of claim 3 unambiguously, a requirement for anticipation. Accordingly, the rejection of claims 3 and 6 as anticipated by Collins is erroneous and should be withdrawn.

Claim 4 describes a high reflectivity multilayer film on the rear end face of the semiconductor laser having at least three paired layers of two films each and a final film, i.e., a minimum of seven layers. Each paired layer includes films of aluminum oxide and tantalum oxide. While Collins does disclose the use of films of aluminum oxide and tantalum oxide, the particular arrangement of those films as in claim 4 is never described by Collins. Because of these differences Collins cannot anticipate claim 4 so that that rejection should be withdrawn.

Examined claim 4 was rejected as anticipated by Moser et al. (U.S. Patent 6,721,348, hereinafter Moser). This rejection is respectfully traversed.

In citing Moser the Examiner directed attention to Table 2, which appears in column 13 of Moser. That table describes various dielectric materials that can be employed in films on semiconductor lasers. The materials include, as in claim 4, aluminum oxide and tantalum oxide. However, there is no discussion concerning how these materials should be arranged in a multilayer film nor of a multilayer film that includes at least seven films. The highly generalized disclosure of Moser lacks the specific description required to anticipate a claim as detailed as claim 4. Therefore, the rejection cannot properly be maintained.

Examined claim 4 was also rejected as anticipated by Shigihara et al. (Published U.S. Patent Application 2004/0042520, hereinafter Shigihara). This rejection is respectfully traversed.

The Examiner directed attention to paragraphs [0066]-[0079] of Shigihara. There is no dispute that those paragraphs, related to Figure 8 of Shigihara, describe a multilayer film having a total of nine layers with the layers alternating between tantalum oxide and aluminum oxide. Thus, at first glance, it may appear that the semiconductor laser to which those paragraphs, describing a particular film of the semiconductor laser, identically match the structure of claim 4. However, there is no such identical match.

The multilayer film described by Shigihara is not on the rear end face of the semiconductor laser and does not have a reflectivity at the characteristic wavelength of the semiconductor laser that exceeds 40%. Rather, the multilayer film described by Shigihara is on the front end face of the semiconductor laser and therefore has a relatively low reflectivity. Attention is directed to Figure 9 of Shigihara which shows that the reflectivity of the film at the characteristic wavelength of the semiconductor laser does not exceed 8%. As pointed out in paragraph [0072] of Shigihara, the described film “may be provided on the front end face of the semiconductor laser element, and a film having an appropriately high reflectivity may be provided on the back end face facing the front face.”

Clearly, the disclosure of Shigihara in paragraphs [0071], [0072], and [0077] demonstrates that Shigihara cannot anticipate claim 4. Further, Shigihara demonstrates a fundamental fallacy of all four rejections made in the Office Action. According to the Office Action, because the “structures” of the films in the cited references are the same as the films claimed, those films in the references inherently have a reflectivity exceeding 40%. The error occurs because of a misunderstanding of what constitutes “structure” in the relevant art. The term “structure” cannot mean, in the context of multilayer optical films, merely a comparison of materials of particular layers of a multilayer film nor a comparison of the number of such layers in the multilayer film. The optical characteristics, including reflectivity, of such films are highly sensitive functions of not only the materials, but also of the number of layers of the materials, the sequential arrangement of the layers of the materials, and the thicknesses of the

respective films. Thus, there is a fundamental error in each of the four rejections in the Office Action which should not be renewed in any further Office Action.

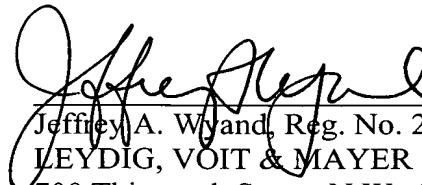
Examined claim 3 was rejected as anticipated by Matsuoka et al. (Published U.S. Patent Application 2004/019056, hereinafter Matsuoka). This rejection is respectfully traversed.


As an initial matter, Matsuoka is not prior art because its effective date, March 4, 2004, is after the priority date of the present patent application, April 23, 2003. Applicants reserve the right, if necessary, to submit a certified English language translation of the priority patent application to perfect the priority claim pursuant to 37 CFR 1.55 and remove Matsuoka as prior art. However, because the rejection is also factually incorrect, even if Matsuoka were prior art, the rejection is traversed.

The fundamental factual error in the rejection based upon Matsuoka is that the film referred to in the rejection, the film 10 of Matsuoka, is on the front end face of the semiconductor laser and because the film 10 has a reflectivity of no more than about 8%, see the graphs of Figures 2-17, at the characteristic wavelength. This fact may have not been apparent from the portion of Matsuoka cited in the rejection, but consultation with the subsequent paragraphs, beginning with paragraph [0052], makes entirely clear that Matsuoka fails to match claim 3 because the film 10 is on the wrong face of the semiconductor laser and because the film 10 has the wrong reflectivity, even if the materials of Matsuoka's film are the same as the materials as examined claim 3. Because of these differences, the rejection must be withdrawn.

Since none of the four anticipation rejections can properly be maintained, upon reconsideration, all of the remaining claims, claims 3-7, should be allowed.

Respectfully submitted,


Jeffrey A. Wyand, Reg. No. 29,458
LEYDIG, VOIT & MAYER
700 Thirteenth Street, N.W., Suite 300
Washington, DC 20005-3960
(202) 737-6770 (telephone)
(202) 737-6776 (facsimile)

Date: 
JAW/jj